

**THE ECOLOGICAL BASIS FOR RIVER MANAGEMENT** edited by D. M. Harper and A. J. D. Ferguson, John Wiley and Sons, Chichester, 1995. No. of pages xvi + 614, Price: £79.95. ISBN 0-471-9515-1X.

This substantial and timely volume consists of 40 chapters covering a broad range of topics concerned with river management. The book is the result of an international conference held at Leicester University in March 1993, after the National Rivers Authority (NRA) in England and Wales had been established for four years. Intentionally, the authors and contributors are a mix of practitioners and academics involved with river management, many from the UK and other European countries, a few from Australia and South Africa, but none from North America. This gives a good breadth to the experiences of the authors, although it is unfortunate that the vast experience of river management in North America is not represented. Also intentionally, the topics addressed are those which had been high on the agenda during the NRA's short lifespan.

The book is not divided into sections, but the editors indicate that it is ordered into six main themes with chapters 1–10 dealing with issues of water quantity, chapters 11–17 with water quality, chapters 18–25 with management of the river environment, chapters 26–31 with management of fish stocks, chapters 32–35 with fishing and other recreational activities, and the final chapters (36–40) with wider issues of catchment management. The book would be easier to use if it was more obviously divided into sections, particularly since it only gradually becomes clear that the first chapter in each section is more generalized and introductory than the following chapters.

The overall range of topics presented in one volume makes for a very useful reference collection for academics and practitioners alike, and an essential tome on the bookshelf for anyone interested in rivers. There is, however, a noticeable omission in the book since it contains relatively little on the management of riparian areas to balance the wealth of information on in-stream issues. A chapter by Wade does include a section of bankside and riparian communities, and another chapter by de Waal, Child and Wade discusses the management of three alien invasive riparian species. There is also an

interesting study by Gurnell, Simmons and Edwards which explores the use of multivariate ecological analyses and a GIS for characterizing the river environment from the riparian and in-channel plant species present. A further chapter by Smith, Youdan and Redmond discusses practical aspects of restoring a tributary of the River Nene, emphasizing the importance of integrating channel restoration with riparian land use.

Management of flows and assessing the flow needs of in-stream species using standard models such as PHABSIM are discussed in the first section of the book. However assessment of the flow needs of riparian species and the management of flows for riparian as well as in-stream plant and animal communities is a poorly developed area of research and this gap is reflected in the book. A chapter by Brookes on the importance of high flows for riverine environments brings to the fore the importance of examining geomorphological change in channel patterns through time, and particularly their response to floods. Clearly flooding patterns are of prime importance in both the creation and maintenance of riparian areas and the plant and animal communities that they support. The literature on riparian and particularly on floodplain zones is large, especially in continental Europe and North America, reflecting an appreciation of the linkages through flooding and runoff patterns between the channel and the floodplain. The emphasis on in-stream issues in this book undoubtedly reflects the former NRA's priorities to date and rightly so, but it is to be hoped that the new Environment Agency's agenda will move with the times and embrace a broader concept of river management. Unfortunately, as pointed out by Boon in his chapter on the relevance of ecology to the statutory *protection* of British rivers, in the UK at least, inclusion of substantial riparian zones, let alone wider catchment areas, is unlikely to become a statutory duty of the Environment Agency because of the financial (and presumably political) costs.

FRANCINE M. R. HUGHES  
*Department of Geography*  
*University of Cambridge*  
*Downing Place*  
*Cambridge*  
*CB2 3EN, UK*

**NEW UNCERTAINTY CONCEPTS IN HYDROLOGY AND WATER RESOURCES** edited by Z. W. Kundzewicz, Cambridge University Press/UNESCO/IASH International Hydrology Series, 1995. No. of pages: xiii + 322. Price: £75.00 (hb). ISBN-0-521-46118-9.

This set of papers stems from an International Workshop on *New Uncertainty Concepts in Hydrology and Water*

*Resources* held at Madralin, Poland, in 1990. Given the title of the volume and workshop it is a pity that it has taken four years to produce the proceedings, especially since many of the methods presented in 1990 were not particularly new then. However, there is much of interest in the 37 papers presented, the first of which, by the editor Professor Kundzewicz, gives a good overview of the other contributions and of the trends in this rapidly developing area of research. The papers are organized

in five rather loose groupings: Facets of Uncertainty (from plotting positions to the analysis of outputs from general circulation models); Novel approaches to Uncertainty (including fractals, fuzzy sets, pattern recognition and non-parametric methods); Random Fields; Time Series and Stochastic Processes; and, finally, Risk, Reliability and 'Related Criteria' (!).

It is clear from this brief outline that the term uncertainty has been given a wide interpretation. There is something to interest nearly every hydrologist, with subjects covered ranging from groundwater monitoring design, point and non-point pollutant transport modelling, analysis of rainfall data, rainfall-runoff modelling, flood frequency analysis, reservoir design and operation, reliability analysis of water resource systems, and more. The range properly reflects the widespread usage of stochastic and statistical models in hydrology today.

One area receives significantly greater coverage than any other: the application of fractal concepts to rainfall data. This is primarily because of an extended invited paper (some 42 pages) on 'Multifractals and Rain' written by Lovejoy and Schertzer and representing the best summary I have seen anywhere of both their work and that of others on this topic (including some work published well after the Madralin conference). Lovejoy and Schertzer deal with the background to fractal concepts, the problem of robust parameter calibration, and the future possibility of multifractal forecasting methods for fields and extreme statistics. Their paper is supported by other fractal rainfall analyses for rainfalls in the Sahel by Hubert *et al.*, radar data by Zawadzki and high-frequency time-series data by Georgakakos *et al.* Together these provide an excellent introduction to the subject.

Interestingly, while a good many of the papers in this volume deal with the calibration of stochastic, statistical or fuzzy models by data, very few present any estimates of predictive uncertainty. Two papers by Mizumura, for example, present applications of fuzzy set theory and pattern recognition to rainfall-runoff modelling problem. In both papers there is a figure of observed and

predicted discharges, both of which are represented as a single line. The errors are, for some time steps, significant, but where is the estimate of confidence in the predictions? Again, two figures of observed and predicted time series of well levels are presented by Feluch, with data and predictions also presented as single lines without estimates of prediction confidence. There are likewise a number of figures throughout the volume from different studies of flood discharge exceedance predictions. The paper by Guo Sheng Lian, in particular, compares several different distributions fitted by non-parametric methods. The exceedances are plotted to return periods of greater than 500 years. The estimates are clearly probabilistic, differ greatly between the distributions, but do not, as presented, appear to be uncertain!

A plea is thus made here for hydrologists to be more circumspect about making predictions without associated estimates of the uncertainty in those predictions. The presentations in this volume demonstrate that, in some ways, there is an increasing awareness and range of techniques available for dealing with the natural heterogeneity and non-stationarity of hydrological variables. Risk and reliability analyses are available for taking account of probabilistic estimates of the occurrence of events and of conjunctions of events, perhaps using multiple realizations generated from some model of the process. There appears to be much less appreciation and use of the fact that the approximations inherent in those models lead to additional uncertainty. There seems to be no inherent technical reason why this should be so; perhaps making multiple realizations of a model for many multiple realizations of its parameters is still computationally too demanding for many applications. Then there is the added problem of uncertainty arising from different model representations . . .

KEITH BEVEN

Lancaster University  
Dept. Environmental Sciences  
Lancaster  
LA1 4YQ, UK

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COASTAL PROBLEMS: GEOMORPHOLOGY, ECOLOGY AND SOCIETY AT THE COAST by Heather Viles and Tom Spencer, Edward Arnold, London, 1995. No. of pages: x + 350. Price: £40.00 (hb), £15.99 (pb). ISBN 0-340-62540-6.

I thoroughly enjoyed reading this book. Viles and Spencer have accomplished the difficult task of writing a book which explains the workings of coastal systems and problems that affect them in a language that is accessible to the lay reader, student and teacher. The book 'aims to elucidate the ecological, geomorphological and to a lesser extent, societal setting of coastal problems with a

view to improving the success of coastal management'. Viles and Spencer define coastal problems as 'natural and/or human-induced events or processes that affect environment and society at the coast' and explore this subject from a holistic perspective which appreciates the interdependence of people, natural processes and ecology in generating and expressing these issues. A consistent theme throughout the book is the need to understand why coasts are problematic, in order to work with the problems to mitigate their effects.

On a cautionary note, the enormous scope of the book has resulted in a tendency to a generalized approach which fails to add satisfactory depth to certain subjects which may disappoint the serious scholar. However,